Return to Learn: Navigating the Road from Injury to the Classroom

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Objectives

- Definition and Epidemiology
- Concussion Pathophysiology
- Legislation
- Medical Management
- Practical Implementation

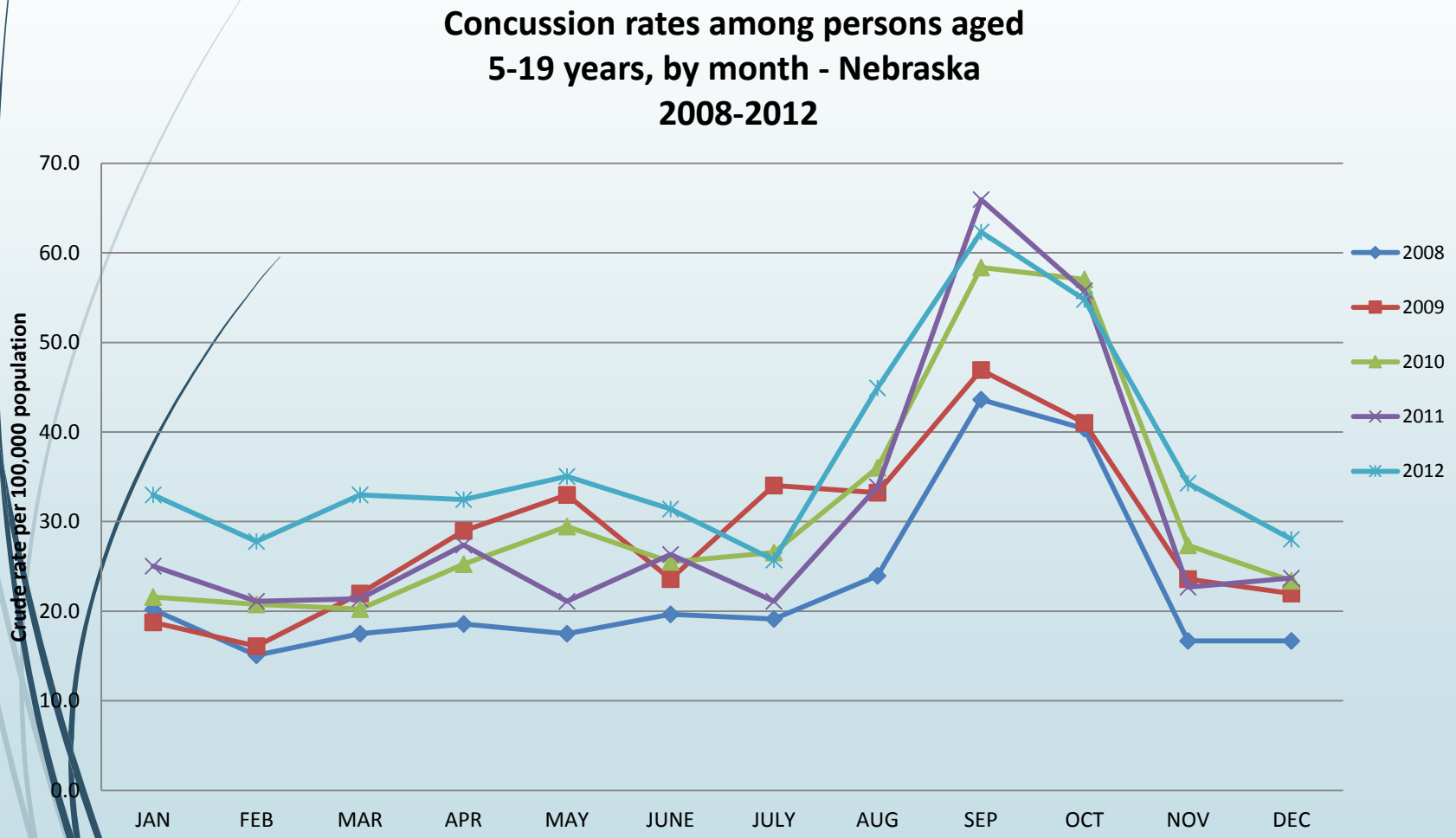
Definition

- Mild TBI (traumatic brain injury) is a direct or indirect force to the head that results in immediate short-lived neurologic impairment (eg, amnesia, loss of consciousness, confusion)
- Transient neurologic impairment quickly resolves, but is often followed by concussion symptoms, which can affect
  - Physical
  - Cognitive
  - Emotional
  - Sleep

Epidemiology

- Approximately 7 million children seek medical attention for a TBI each year
- Over 500,000 visit the Emergency Department
- Concussion rates per 1000 AE (athletic exposures)
  - Football (0.47-0.6)
  - Girls' Soccer (0.35-0.36)
  - Boys' Soccer (0.17-0.22)
  - Girls' Basketball (0.16-0.21)
  - *Cheerleading unique in that more injuries occur in practice setting than game/competition*

Epidemiology



Pathophysiology

- Energy Crisis
  - Mechanical trauma → neuronal cell membrane stretching → ionic disequilibrium → mitochondrial dysfunction
    - Cells switch from aerobic to glycolytic pathways
    - Extracellular lactate accumulates, causing acidosis
- Alterations in Cerebral Blood Flow
  - Hyperperfusion documented in first 1-3 days after injury
  - Hypoperfusion follows in day 4-15 and beyond
- Injury is at the cellular level, affecting function – rarely does cellular death or structural changes occur

Pathophysiology

- Problem is thus with the 'software' and not the 'hardware' of the brain
- When the brain is challenged, it must operate in a less efficient anaerobic state
- Making demands on the injured brain not only produces symptoms, but it can also delay recovery
- The goal in concussion management is for the student to operate at a sub-symptom threshold

Pathophysiology

- Majority of students have resolution of symptoms in a few days, and ~90% within 3 weeks
- Adults and collegiate athletes tend to recover much quicker (3-7 days) than high school athletes (10-14) days
- Little data on younger aged athletes

Legislation

- In 2011, in both Iowa and Nebraska, legislation was enacted that recognized the impact of concussions and attempted to establish awareness. Contained the 3 tenets of model legislation
  - Education – coaches, parents, student-athletes
  - Removal from play
  - Clearance by a licensed health practitioner

Legislation

- These Acts have helped to educate and protect athletes and guide return to play decisions
- However, guidance was needed to help manage the academic effects concussions had on students
- In 2014, Nebraska amended the Concussion Awareness Act to require schools to have a Return to Learn protocol in place for students who have sustained a concussion
  - Informal or formal accommodations
  - Curriculum modification

Concussion Management

- Early management (0-21 days)
  - Recognize a concussion has occurred
  - Identify all symptoms
  - Educate patient and family
  - Obtain consent to communicate with school
  - Recommend school accommodations/activity restrictions
  - Consider Educational Liaison referral

Imaging

- CT/MRI generally not indicated
- fMRI shows correlation with symptom severity but not recommended
- Red Flags
  - Declining level of consciousness
  - Seizures
  - Focal neurologic findings
  - Intractable vomiting
  - Rhinorrhea/otorrhea

Concussion Symptoms

- Physical
  - Headaches
  - Balance difficulty
  - Vision complaints – blurred/double vision, photosensitivity
  - Appetite changes
- Cognitive
  - Attention and concentration
  - Memory – retention and working memory
  - Executive function impairments – organization, multi-tasking

Concussion Symptoms

- Emotional
  - Irritability
  - Depression/withdrawal
  - Anxiety
  - Strained family and friend relationships
- Sleep Disturbance
  - Impaired sleep initiation and maintenance
  - Daytime fatigue

Initial Management

- Removal from sports
- Reduce/eliminate screen time
- Relative Rest
- School modification
  - Allow rest breaks when symptoms develop
  - No testing

Initial Management

- Return to Play
  - 1. No activity
  - 2. Light aerobic exercise
  - 3. Sport specific exercise
  - 4. Non-contact training drills
  - 5. Full-contact practice
  - 6. Return to play

Concussion Management

- Late Management (> 3 weeks)
  - Refer to Mild TBI clinic
    - Neuropsychological testing
    - PT, OT, SLP evaluations
    - Neuro-optometry consultation
  - Educational Liaison referral
  - Pharmacologic Therapy

Concussion Treatment

- Highly individualized – each concussion is unique and any interventions should be made based upon timeline and severity of concussion
- Team approach – involves cooperation between:
  - Student/family
  - School/coaches
  - Medical Team

Concussion Treatment

- Physical Therapy
  - Myofascial release for headache management
  - Improve cervical hypo-mobility
  - Address balance deficits
  - Vestibular evaluation/treatment
- Speech Therapy
  - Address working memory and executive function deficits
  - Assist with academic work and help with organization
  - Develop accommodation strategies for the classroom

Concussion Treatment

- Neuro-optometry
  - Evaluate and make vision therapy recommendations
  - Corrective lenses
  - Help with convergence insufficiency
  - Coordinate with occupational therapy
- Neuropsychology
  - Identify areas of deficiency
  - Track cognitive recovery
  - Address emotional issues and refer to therapy if needed

Post Concussion Disorder

- Symptoms can be categorized into different subsets of post concussion disorder (PCD)
  - Physiologic
  - Vestibulo-ocular
  - Cervicogenic
- Pathophysiology and treatment are different for each category

Physiologic PCD

- Pathophysiology
  - Persistent alterations in cellular metabolism and cerebral blood flow
- Symptoms
  - Headache exacerbated by physical activity
  - Nausea, photophobia, fatigue, difficulty concentration
- Management
  - Physical and cognitive rest
  - Sub-symptom threshold aerobic training
  - School accommodations

Vestibulo-ocular PCD

- Pathophysiology
  - Dysfunction of the vestibular and oculomotor symptoms
- Symptoms
  - Dizziness, vertigo, nausea, gait and postural instability
  - Blurred or double vision, trouble with reading
- Management
  - Vestibular rehabilitation program
  - Vision therapy, prisms
  - School accomodations

Cervicogenic PCD

- Pathophysiology
  - Muscle trauma, dysfunction of cervical spine proprioception
- Symptoms
  - Neck pain, stiffness, decreased ROM
  - Headaches exacerbated by neck movements and not exercise
- Management
  - Manual therapy to cervical spine
  - Head and neck proprioceptive training
  - Occipital nerve blocks

School Management

- Referral to school liaison
- Formal concussion plan vs. 504 vs. IEP
- Accommodations
  - Reduced school time
  - Decreased homework/tests
  - Limit screen time
  - Sunglasses
  - Handouts
  - Quiet areas to eat, study etc.

Post-Concussive Syndrome

- Different than just post-concussion symptoms
- Symptoms include headaches, dizziness, fatigue irritability, sleep problems, affect changes, apathy
- Present for > 3 months after injury
- Must experience social problems
- Risk Factors:
  - Low socioeconomic status
  - Female
  - Age > 40
  - Ongoing legal activity
- Injury less likely related to sports

Concussion Treatment

- Pharmacological Interventions
  - NSAIDs – Excedrin
  - TCAs – amitriptyline, nortriptyline
  - AEDs – gabapentin, valproic acid
  - SSRIs – fluoxetine, Zoloft, Lexapro
  - Stimulants – methylphenidate
  - Botox

Thanks and any questions??